



299-E28-14 (A6792)

Log Data Report

Borehole Information:

Borehole: 299-E28-14 (A6792)		Site: 216-B-56 Crib			
Coordinates (WA State Plane)		GWL (ft)¹: 286.5	GWL Date: 3/28/2002		
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
136,551.3 m	573,848.3 m	Unknown	212.8 m (698.2 ft)	352	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	2.9	8.625	8.0	0.3125	0	352

Borehole Notes:

The logging engineer measured the casing stickup using a steel tape. Two reference point survey "X's" are located at the top and bottom of the casing stickup. Calipers were used to measure the casing wall thickness and the outside diameter; the inside diameter is calculated. Zero reference is the top of casing stickup. Top of casing stickup is rough and unevenly cut. HWIS³ is the source of the TOC elevation and coordinates. Total depth (ground level reference) and casing bottom (TOC reference) are reported from information provided in Ledgerwood (1993). On 03/28/02, the borehole was swabbed. Radon was detected without smearable contamination. The maximum logging depth was 1 ft above the last measured groundwater level.

Logging Equipment Information:

Logging System: Gamma 2A	Type: SGLS (35%)
Calibration Date: 11/01/01	Calibration Reference: GJO-2002-286-TAR
Logging Procedure: MAC-HGLP 1.6.5, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	Repeat
Date	04/18/02	04/19/02	04/22/02	04/23/02	04/23/02
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	51.0	135.0	285.5	187.5	65.0
Finish Depth (ft)	3.0	50.0	186.5	134.0	35.0
Count Time (sec)	100	100	100	100	100
Live/Real	R	R	R	R	R
Shield (Y/N)	N/A ⁴	N/A	N/A	N/A	N/A
MSA Interval (ft)	0.5	0.5	0.5	0.5	0.5
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	BA133CAB	BA134CAB	BA135CAB	BA136CAB	BA135CAB
Start File	BA133000	BA134000	BA135000	BA136000	BA135108
Finish File	BA133096	BA134170	BA135198	BA136107	BA135168
Post-Verification	BA133CAA	BA134CAA	BA135CAA	BA136CAA	BA135CAA

Log Run	1	2	3	4	Repeat
Depth Return Error (in)	-0.75	0	-0.5	N/A	+2.5
Comments	Fine-gain adjustment notes below.	Fine-gain adjustment notes below.	Fine-gain adjustment notes below.	Fine-gain adjustment notes below.	Repeat section. No fine-gain adjustments.

Logging Operation Notes:

Zero reference is the top of casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT verifier with SN 082.

During the SGLS logging, fine-gain adjustments were necessary to maintain the 1460-keV (^{40}K) photopeak at a pre-described channel. During log run 1, fine-gain adjustments were made after files BA133005, BA133012, BA133029, BA133040, BA133059, and BA133070. On 04/19/02, during log run 2, fine-gain adjustments were made after files BA134028 and BA134058. On 04/22/02, during log run 3, fine-gain adjustments were made after files BA135023, BA135114, and BA135189. On 04/23/02, during log run 4, fine-gain adjustments were made after files BA136021 and BA136031.

Unresolved waste management issues prevented logging below the current groundwater level.

Analysis Notes:

Analyst:	Sobczyk	Date:	06/03/02	Reference:	MAC-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all within the control limits except for BA130CAA. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were within about 6 percent. The post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC Supervisor.

Spectra for the SGLS were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Concentrations were calculated in EXCEL (source file: G2ANov1.xls), using parameters determined from analysis of recent calibration data. Zero reference is the top of the casing. The casing configuration was assumed to be one string of 8-in. casing with a thickness of 0.322 in. to the maximum depth of the log. A casing thickness of 0.322 in. is the published value for ASTM schedule-40 steel pipe (a commonly used casing material at Hanford). This casing thickness is within the range of measurement error associated with the logging engineer's measurements. A water correction was not needed or applied to the SGLS data. Dead time corrections were not needed because dead time did not exceed 10.5 percent.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the

naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it appears to be less affected by the presence of radon in the borehole.

Results and Interpretations:

^{137}Cs was the only man-made radionuclide detected in this borehole. ^{137}Cs was detected near the ground surface (3.0- and 3.5-ft log depth) at activities ranging from 0.2 to 0.6 pCi/g. At 20.0 ft, ^{137}Cs was detected with an activity near its MDL of about 0.2 pCi/g. Near the water table, ^{137}Cs was detected at log depths of 272.0, 274.5, 277.5, and 283.5 ft at activities ranging from 0.2 to 0.3 pCi/g.

Recognizable changes in the KUT logs occurred in this borehole. ^{232}Th activities appear to increase by about 0.2 pCi/g in the interval from 64 through 97 ft along with a corresponding slight increase in ^{40}K . ^{232}Th activities appear to increase by about 0.3 pCi/g in the interval from 155 through 157 ft along with a corresponding increase in total gamma. A decrease in apparent ^{40}K activities of about 3 pCi/g occurs from about 223 through 227 ft. In this interval, there is a slight increase in total gamma and apparent ^{232}Th activities. Apparent ^{40}K activities appear to decrease by about 4 pCi/g at about 275-ft log depth.

The behavior of the ^{238}U log suggests that radon is present inside the borehole casing. This effect is observed in log runs 2 and 3 in the intervals from 50.0 through 95.0 ft and 186.5 through 245.0 ft. The effects of radon appear to be minimal in the other log runs. Radon daughters such as ^{214}Bi may also “plate” onto the sonde itself. When this occurs, there is a gradual increase in total counts as well as photopeak counts associated with ^{214}Bi and ^{214}Pb . This phenomenon appears to best explain the observed ^{238}U values in log runs 3, 4, and the repeat log run. The presence of radon is not an indication of man-made contamination; it is derived from decay of naturally occurring uranium. As a gas, radon moves easily in the subsurface, and concentrations of radon and its associated progeny can change quickly.

Aside from the effects of radon observed on the ^{238}U log (609 keV and 1764 keV), the plots of the repeat logs demonstrate good repeatability of the SGLS data for the naturally occurring radionuclides. Due to the presence of radon in the borehole during log run 2, the repeat ^{238}U log in the interval from 50 to 65 ft appears to detect lower activities based on the 609-keV and 1764-keV photopeaks.

Gross gamma profiles from Additon et al. (1978) (attached) indicate that the amount of gamma-emitting contamination in the sediments surrounding this borehole increased after 1968. The profile from 4/18/68 does not appear to detect gamma activity above background in the borehole. The profile from 5/4/76 detected gamma activity above background in the interval from 328 to 344 ft (100 to 105 m). Above this interval, the SGLS detected ^{137}Cs at log depths of 272.0, 274.5, 277.5, and 283.5 ft. Because of waste management issues, MACTEC-ERS was unable to log beneath the water table in this well. Once the waste management issues are resolved, this well should be logged with the SGLS from 285 to 352 ft (total depth) to investigate the interval from 328 to 344 ft.

References:

Additon, M.K., K.R. Fecht, T.L. Jones, and G.V. Last, 1978. *Scintillation Probe Profiles From 200 East Area Crib Monitoring Wells*, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

Chamness, M.A., and J.K. Merz, 1993. *Hanford Wells*, PNNL-8800, UC-903, Pacific Northwest Laboratory, Richland, Washington.

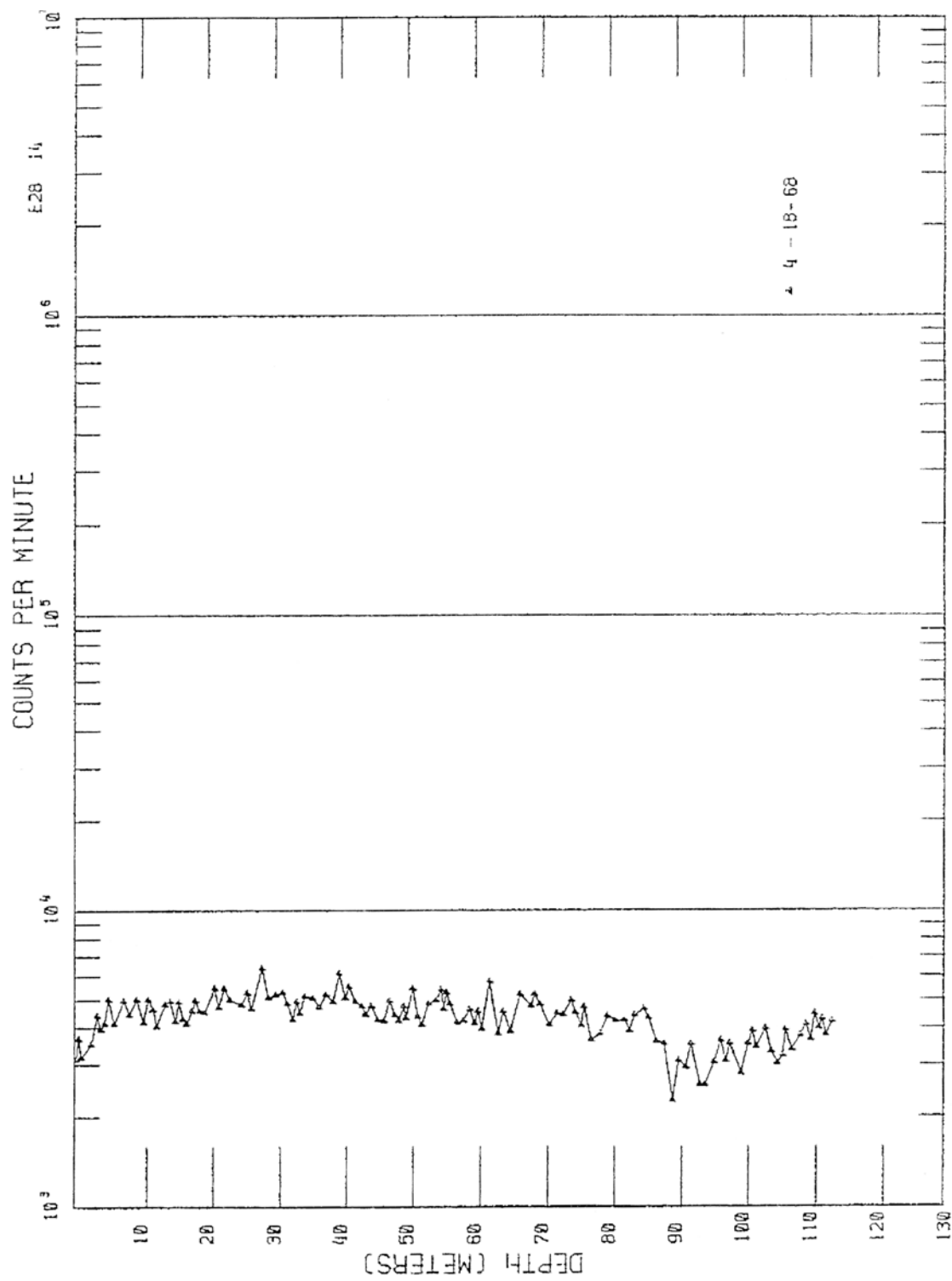
Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

¹ GWL – groundwater level

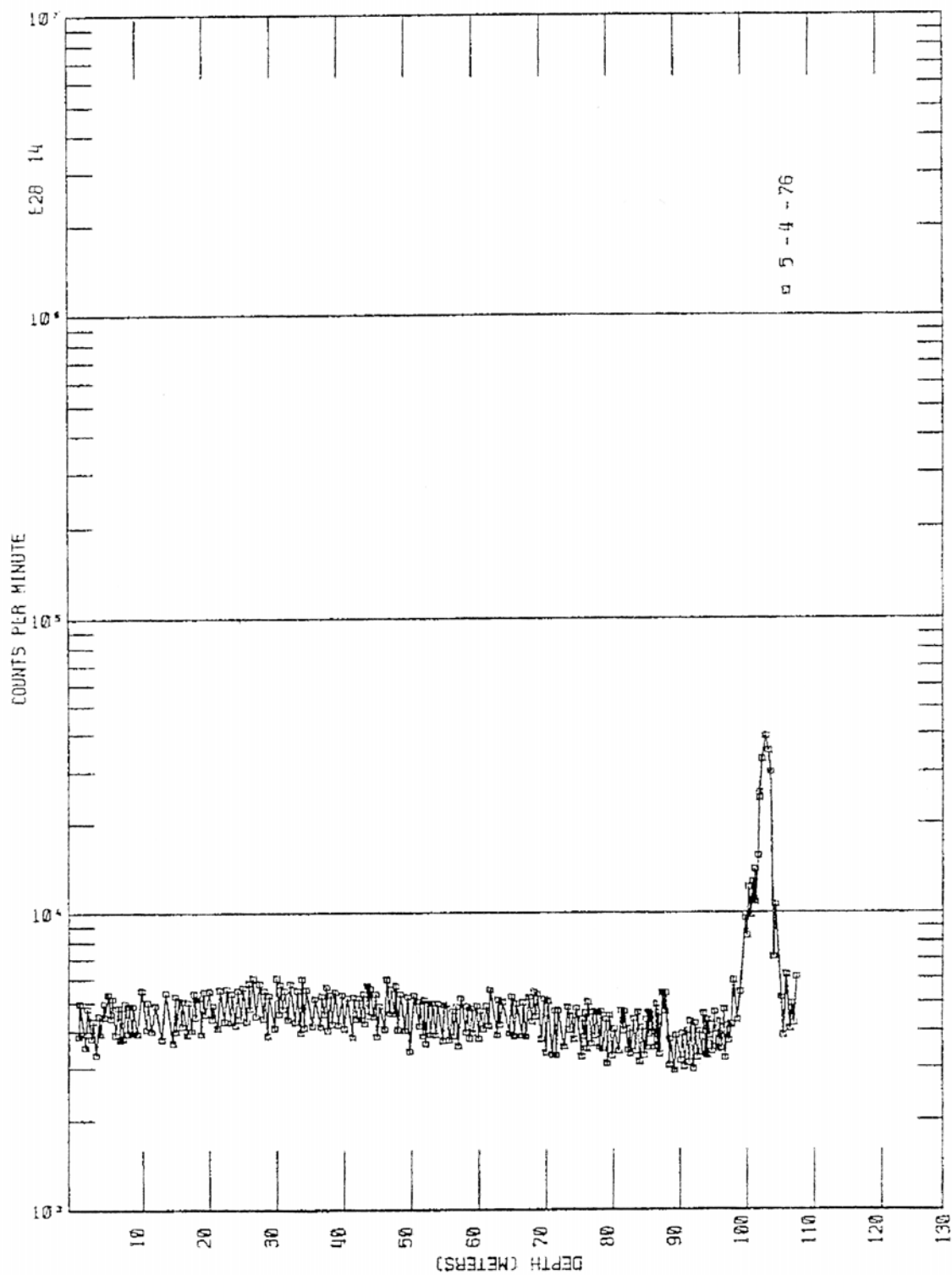
² TOC – top of casing

³ HWIS – Hanford Well Information System

⁴ N/A – not applicable



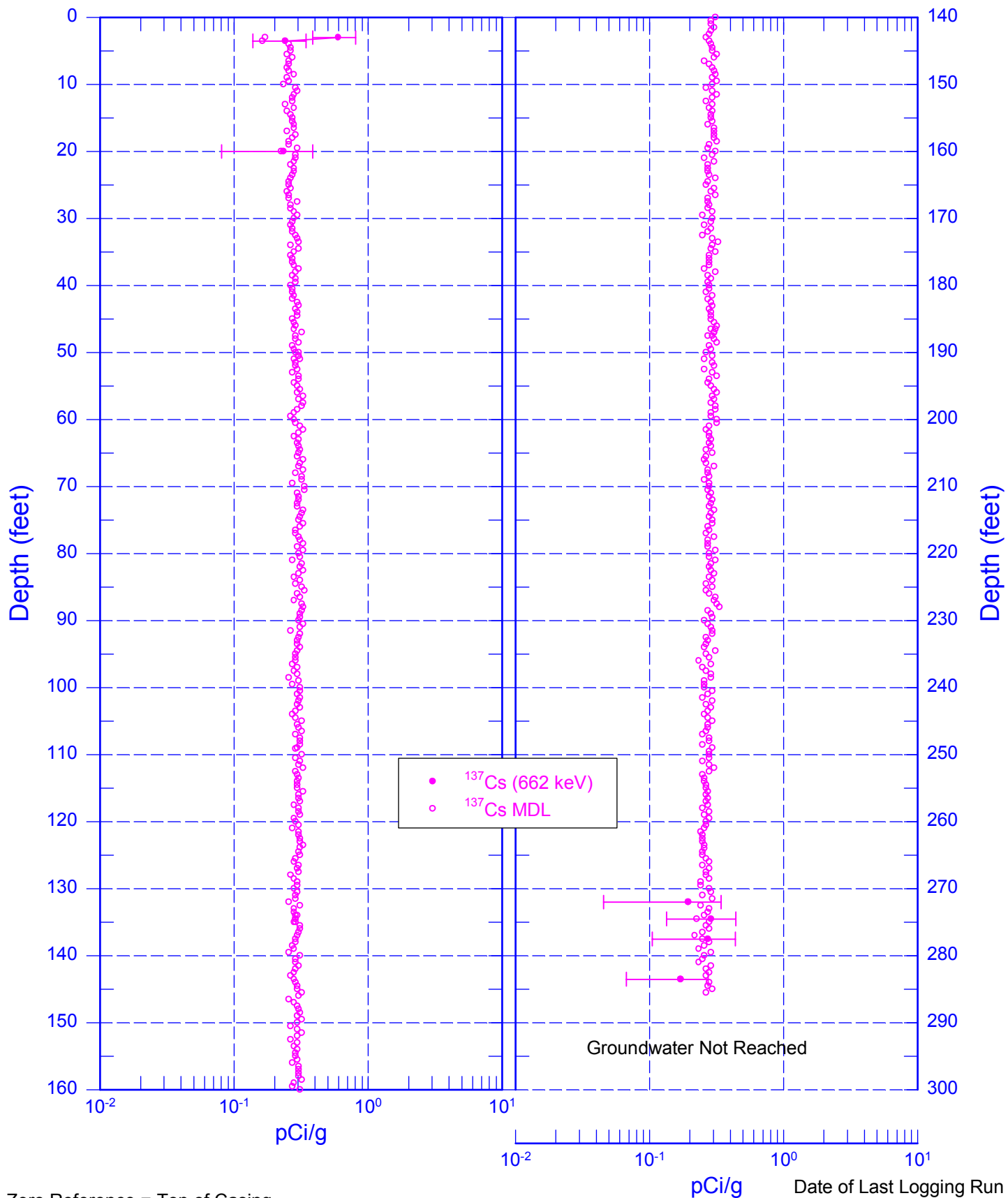
from Additon et al. (1978)



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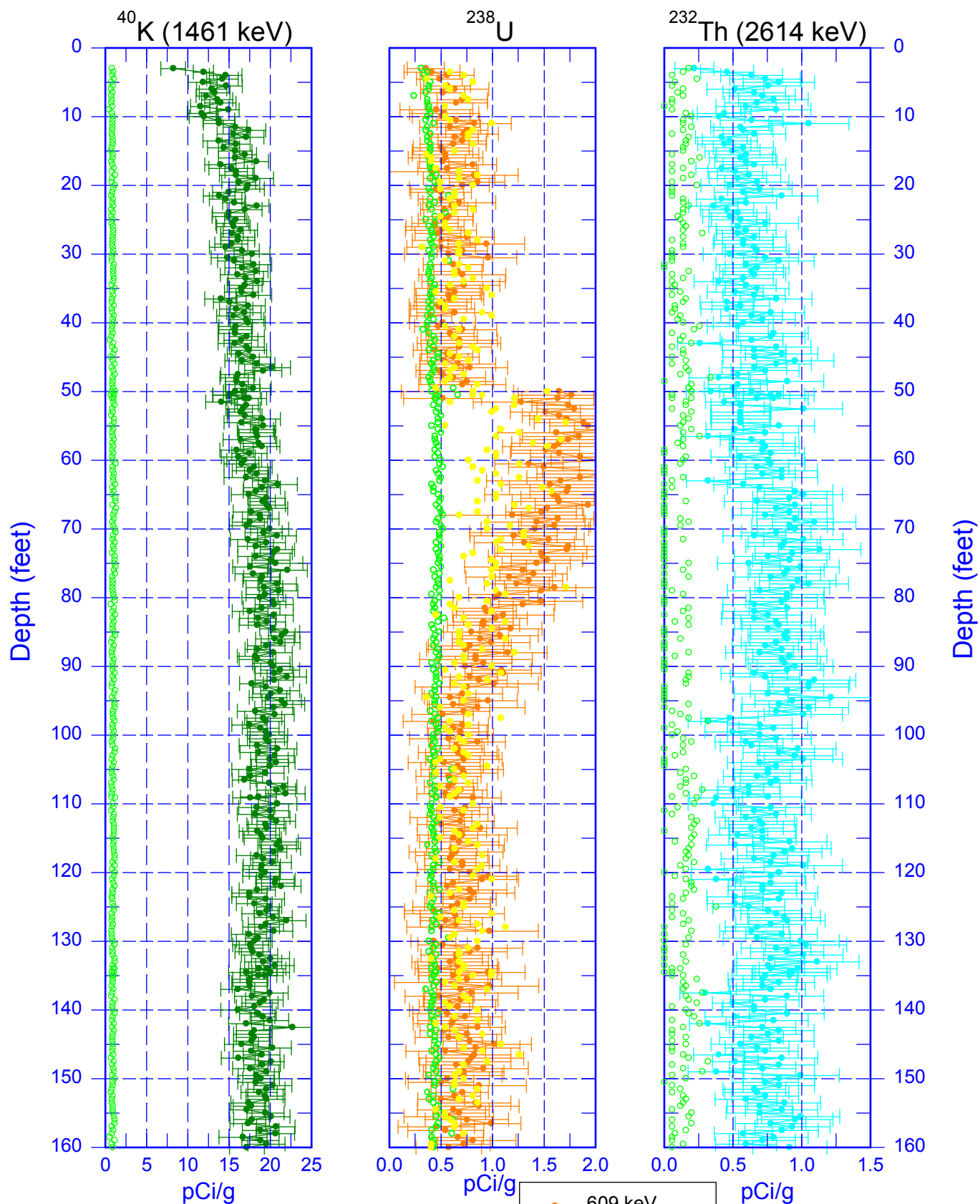
Man-Made Radionuclides



Zero Reference = Top of Casing

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Natural Gamma Logs

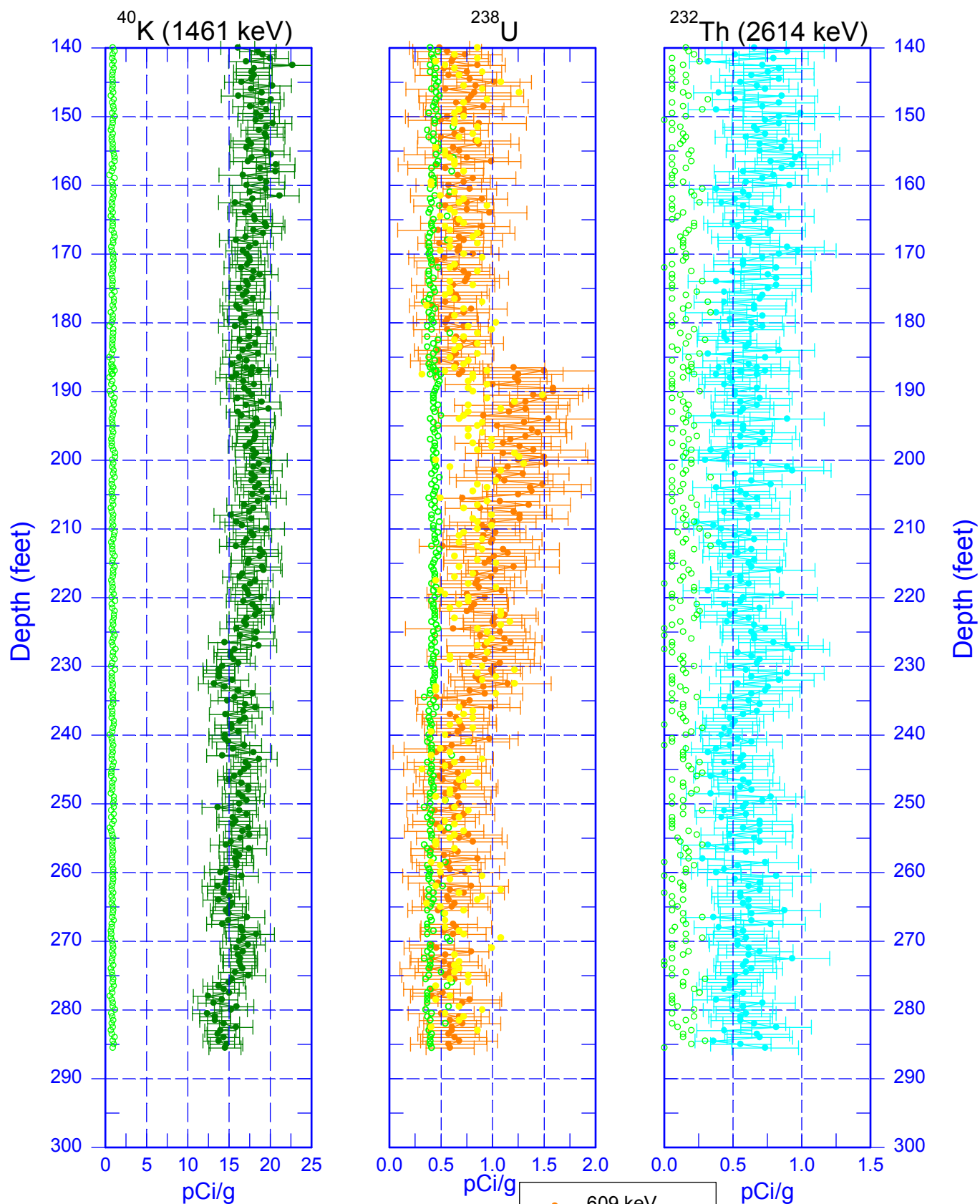


Zero Reference = Top of Casing

Date of Last Logging Run
04/23/2002

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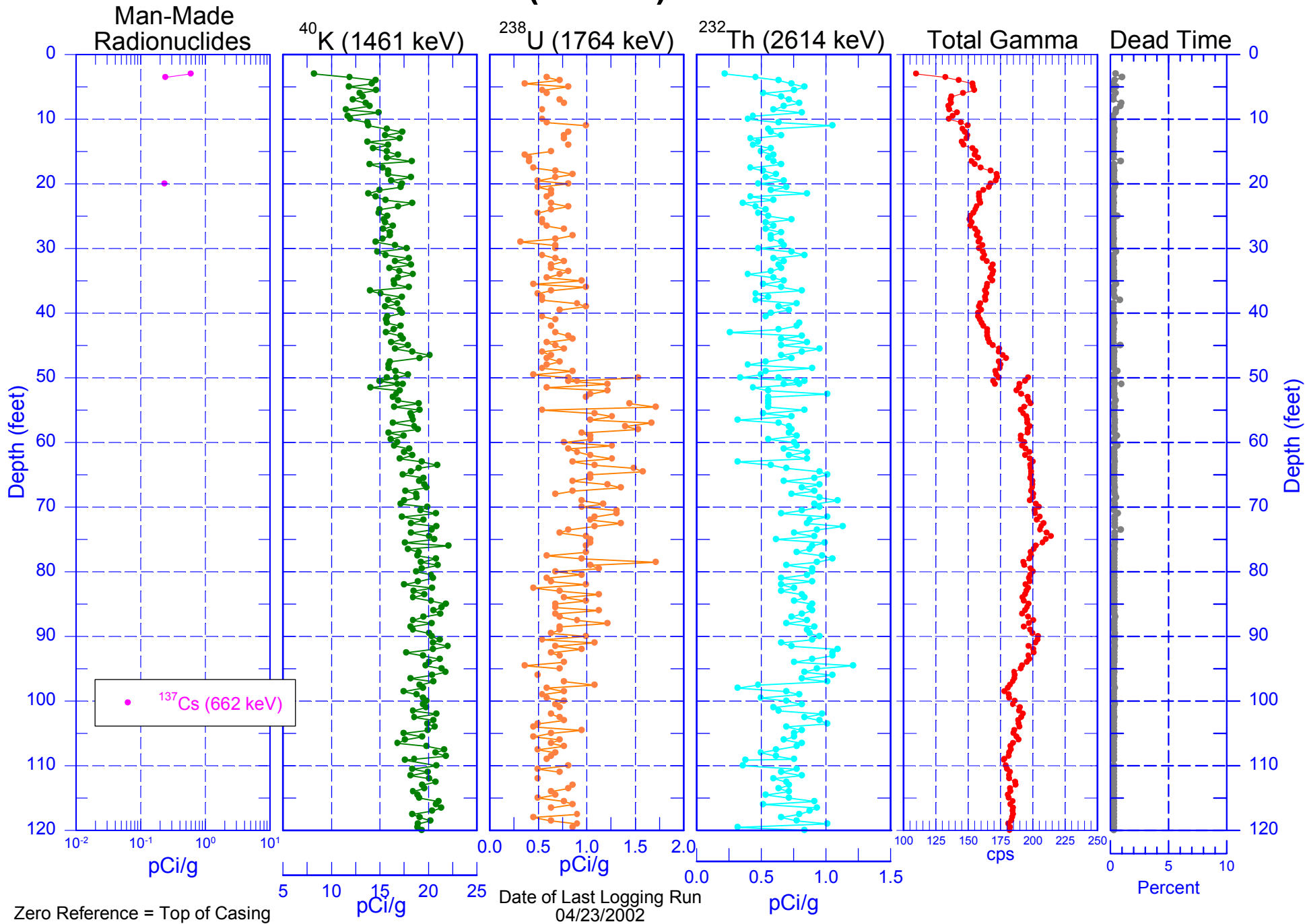
Natural Gamma Logs



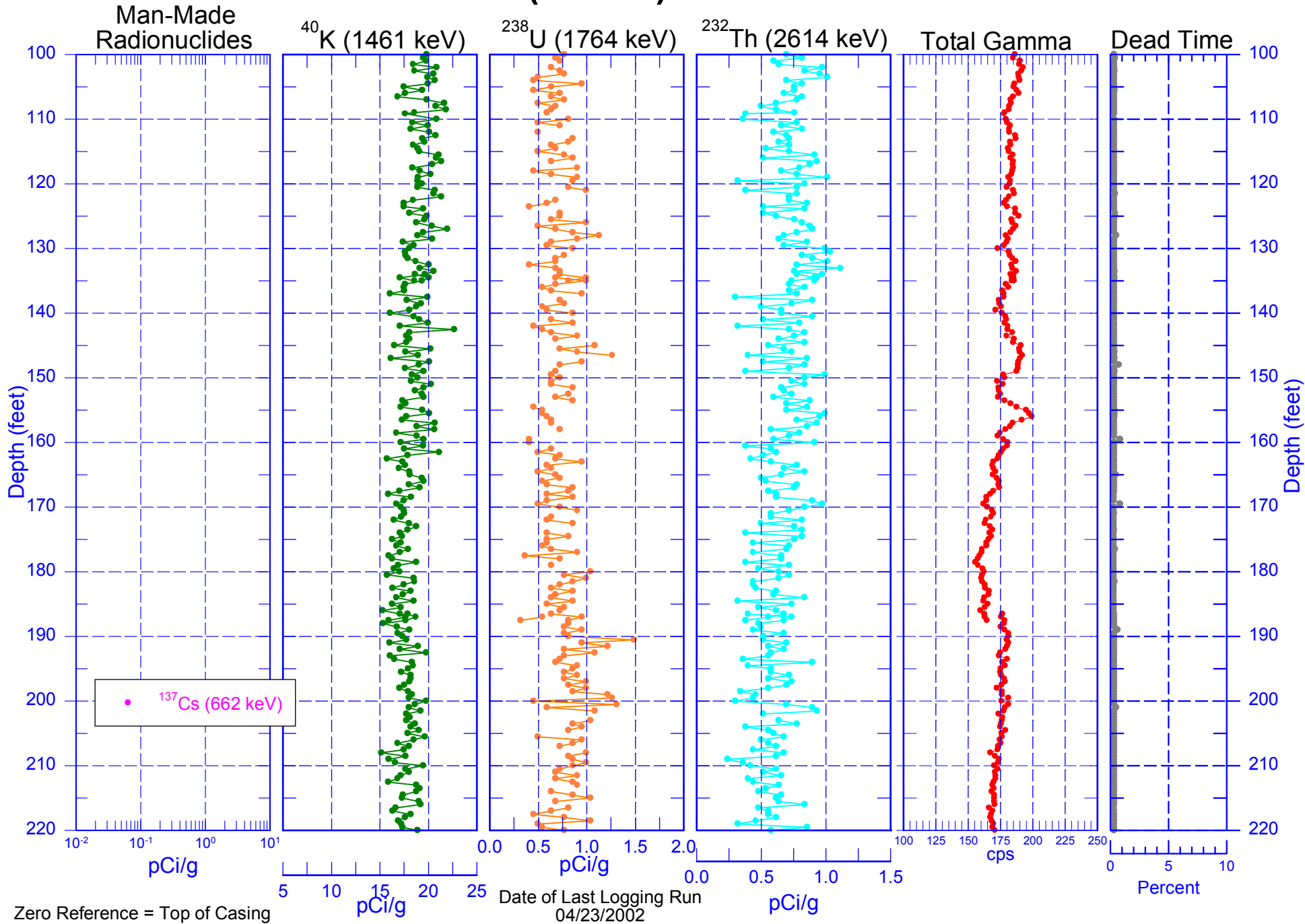
Zero Reference = Top of Casing

Date of Last Logging Run
04/23/2002

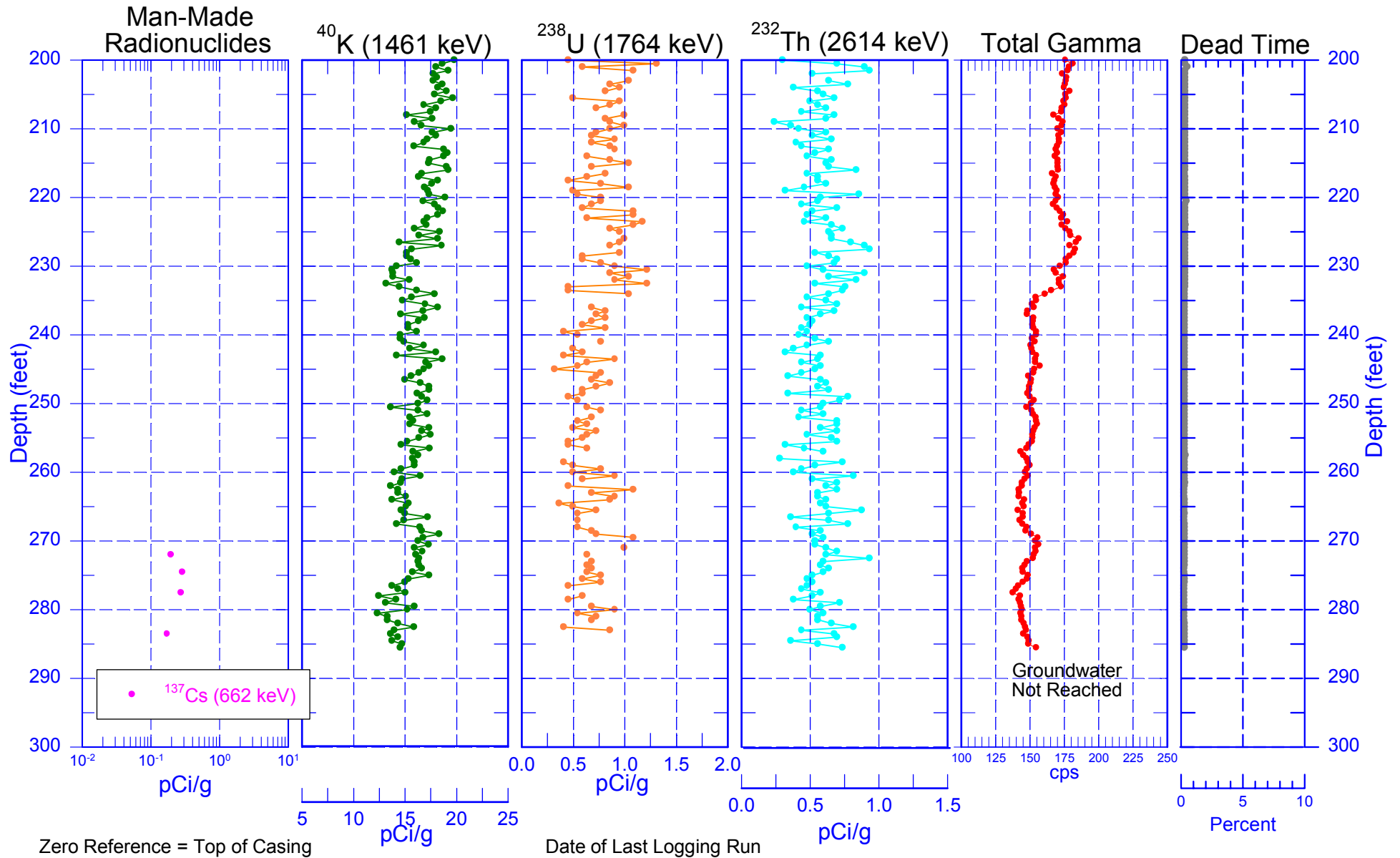
299-E28-14 (A6792) Combination Plot



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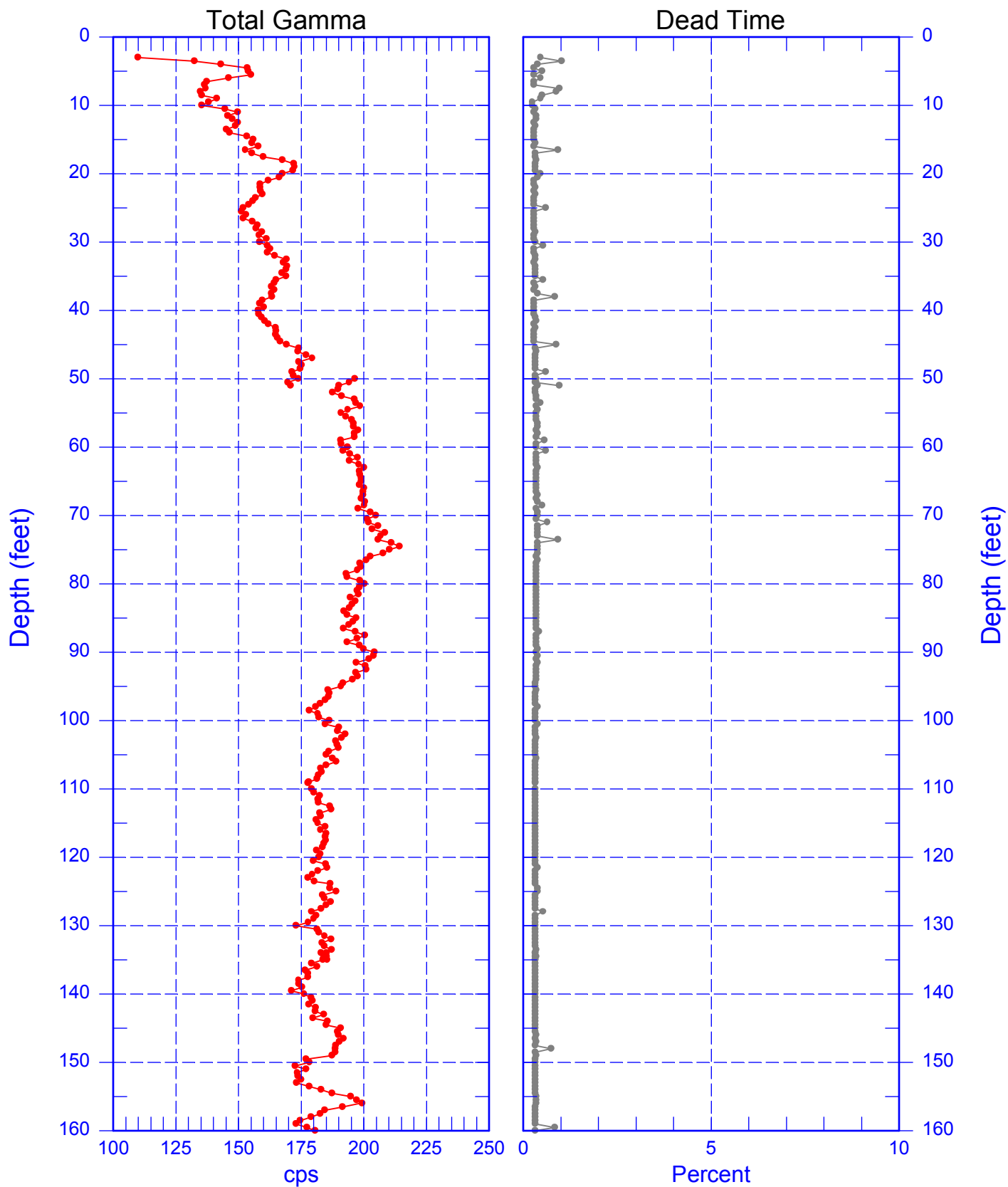


299-E28-14 (A6792) Combination Plot



299-E28-14 (A6792)

Total Gamma & Dead Time

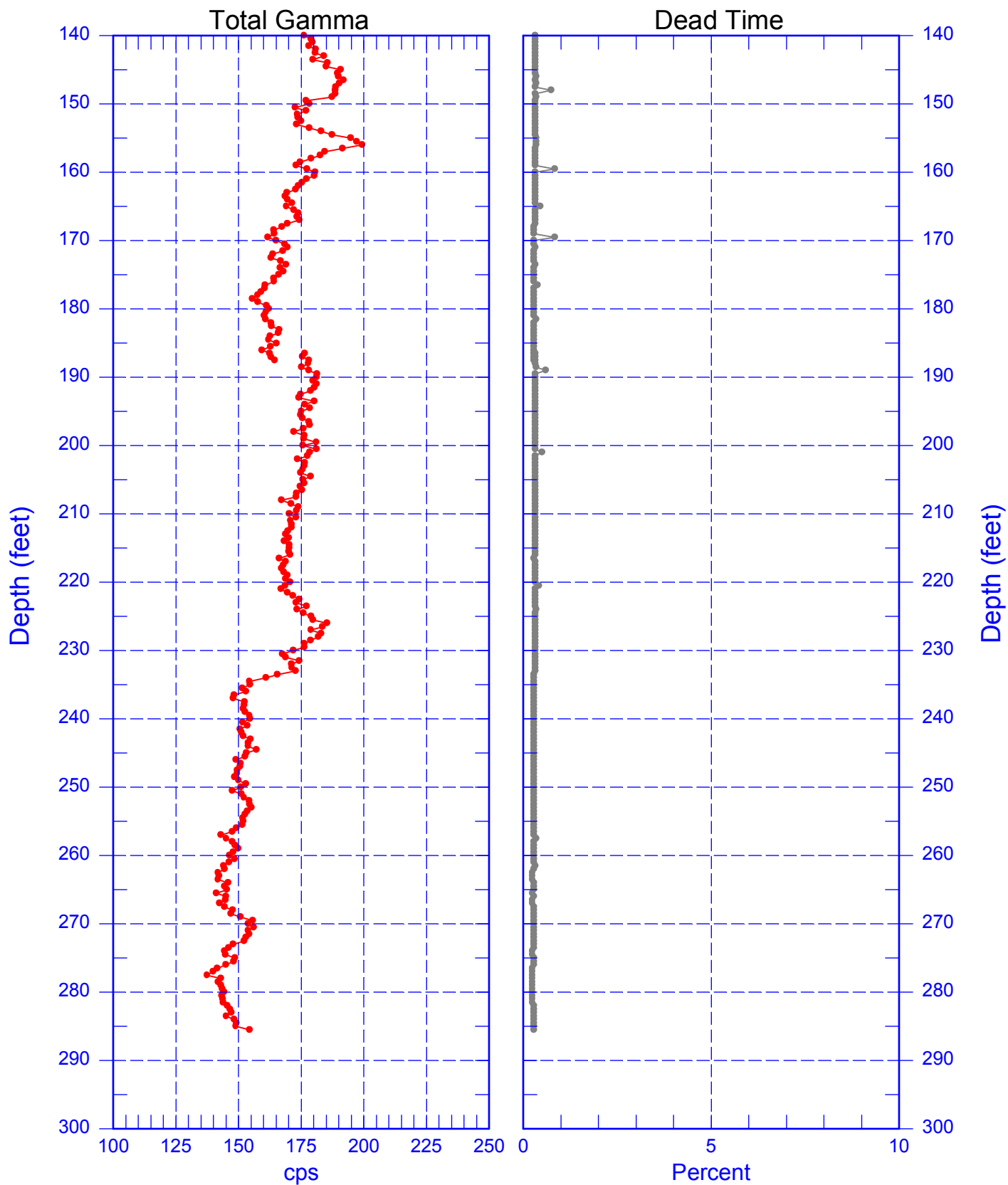


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Total Gamma & Dead Time

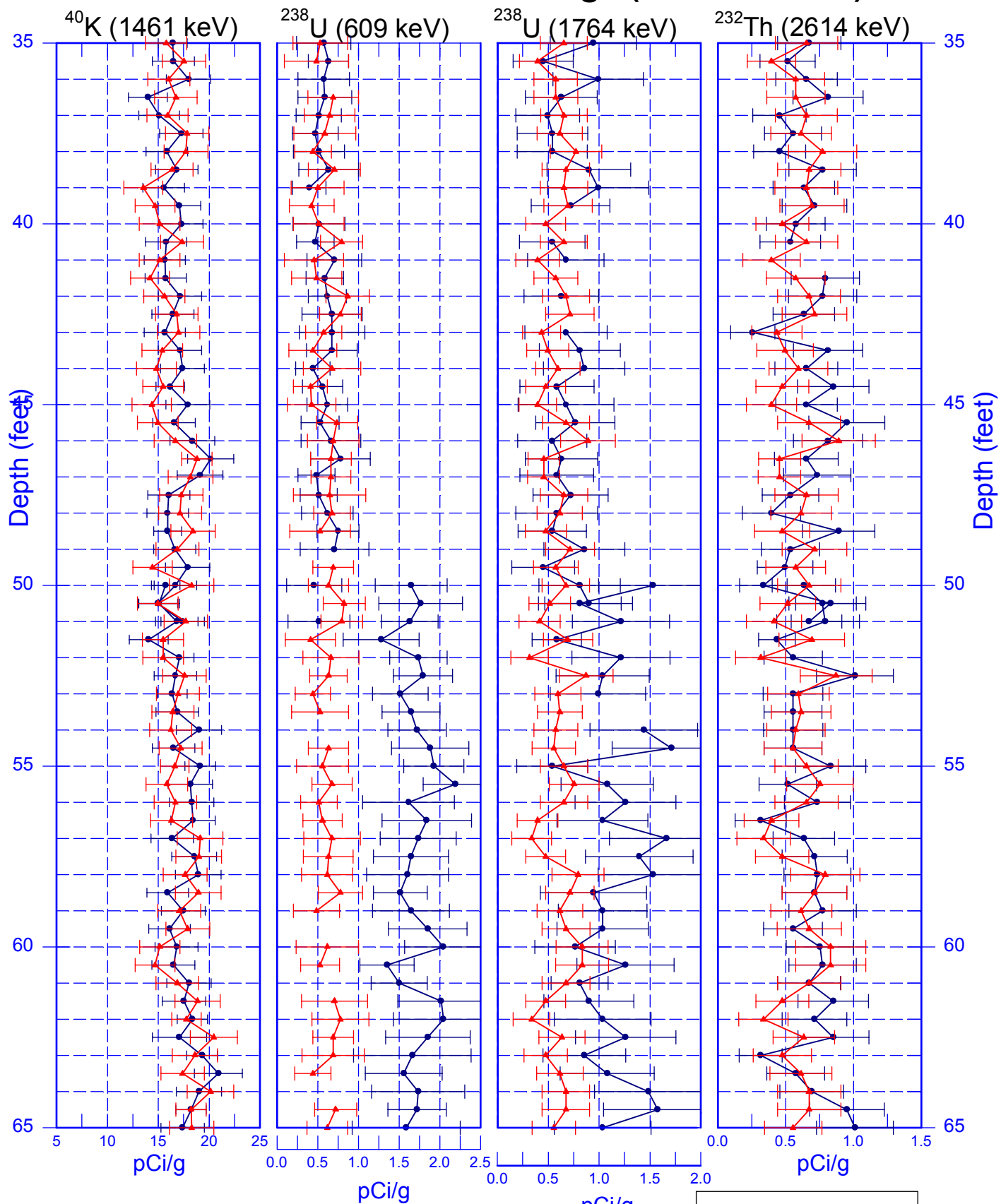


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Zero Reference = Top of Casing

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Rerun of Natural Gamma Logs (35.0 to 65.0 ft)



During the original log run (50 to 65 ft), the 609 and 1764 keV photopeak cps are elevated due to radon.

—●— Original Log Run
—▲— Repeat Log Run